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BEFORE THE BOARD OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

LIVING RIVERS, Petitioner, v. DIVISION OF OIL, GAS AND MINING, Respondent, EARTH ENERGY RESOURCES, INC., Intervenor-Respondent.	**EARTH ENERGY RESOURCES, INC.'S SUBMITTAL OF EXPERT REPORTS** Docket No. 2010-027 Cause No. M/047/0090 A

Pursuant to the Stipulated Order to Continue Hearing and for Amended Prehearing Schedule Intervenor/Respondent Earth Energy Resources, Inc. ("Earth Energy"), hereby submits the expert reports of Robert J. Bayer (attachment A) and Karla Knoop (attachment B).

RESPECTFULLY SUBMITTED this 1st day of February, 2011.

Holme Roberts & Owen LLP

A. John Davis
Christopher R. Hogle
M. Benjamin Machlis
Attorneys for Earth Energy Resources, Inc.

#278271 v1 slc

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on this 1st day of February, 2011, a true and correct copy of the foregoing EARTH ENERGY RESOURCES, INC.'S SUBMITTAL OF EXPERT REPORTS was served via email, as follows:

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Report of Robert J. Bayer, P.G.
JBR Environmental Consultants, Inc

Living Rivers v. Division of Oil Gas and Mining

Cause No. M/047/0090 A
Docket No. 2010-027

Scope

This report, along with the expert report submitted by Karla Knoop, will demonstrate that, with respect to the areas challenged by Living Rivers' experts Elliot Lips ("Lips") and Charles Norris ("Norris"), Earth Energy Resources, Inc.'s ("Earth Energy") Notice of Intention to Commence Large Mining Operations (the "NOI") contains the "general narrative description" of the PR Spring Mine's (the "Mine") projected impacts on surface and ground water systems and erosion control, actions which are proposed to mitigate any such impacts, and the reclamation plan required by Utah Mined Land Reclamation Rules. Utah Admin Code r. 647-4.

Basis of Opinions

Following is a list of material I have reviewed and consulted in the preparation of this report:

JBR Environmental Consultants, Inc. 2008. Report to Utah Division of Water Quality titled Earth Energy Resources, Inc. PR Spring Operation, Uintah and Grand Counties, Utah Ground Water Discharge Permit-by-Rule Demonstration. Submitted February 21, 2008 and appended to the NOI in Appendix B.

JBR Environmental Consultants, Inc. 2009. Storm Water Pollution Prevention Plan, PR Spring Mine, Earth Energy Resources, Inc. Dated March 25, 2009 and appended to the NOI as Appendix G.

JBR Environmental Consultants, Inc. 2009. Notice of Intention to Commence Large Mining Operations, Earth Energy Resources, Inc. PR Spring Mine M0470090. May 2009. Submitted to the Utah Division of Oil, Gas and Mining.

Living Rivers. 2011. Prepared Direct Testimony of Elliott W. Lips on Behalf of Living Rivers. January 7, 2011. Docket No. 2010-027, Cause No. M/047/0090 A.

Living Rivers. 2011. Prepared Direct Testimony of Charles H. Norris on Behalf of Living Rivers. January 7, 2011. Docket No. 2010-027, Cause No. M/047/0090 A.

Utah. 2011. U.A.C. Title R647: Natural Resources; Oil, Gas and Mining; Non-Coal regulations and Title R645: Natural Resources; Oil, Gas and Mining; Coal regulations. As in effect on January 2, 2011.

Holmes and Kimball, 1987, Ground Water in the Southern Uinta Basin Utah and Colorado, USGS Water Supply Paper 2248.

Utah Division of Water Quality. 2008. Letter to Earth Energy Resources from DWQ, concurring with *de minimis* determination and granting permit-by-rule coverage. Dated March 4, 2008 and appended to the NOI.

Utah Division of Water Quality. 2011. General Multi-Sector Industrial Storm Water Permit and associated rules at U.A.C. R317-8, as in effect on January 1, 2011.

In addition, my opinions and conclusions are based on information obtained from: (1) discussions with other JBR personnel, Earth Energy personnel, other consultants and contractors of Earth Energy, and DOGM and DWQ staff; (2) a site visit to the PR Springs Mine area in November 2006; and (3) 38 years of experience as a geologist working on behalf of the mining industry (that experience is set forth in my resume, attached as Exhibit A).

Opinions and Conclusions

The rules the Division of Oil Gas and Mining ("DOGM") has promulgated for non-coal mines (the "Mineral Rules") are less prescriptive than the rules governing coal mining (the "Coal Rules"). Unlike the Coal Rules, the Mineral Rules are written to allow the latitude necessary for mining and reclamation plans to take into account the unique site conditions, mining methods, and commodities being mined. Having served on the Board of Oil Gas and Mining (the "Board") and practiced as a consultant to the Utah mining industry for more than 25 years, I am very familiar with the operational practices of DOGM and the Board's understanding of the legislative intent behind the Utah Mined Land Reclamation Act in terms of its distinction between coal and non-coal mining operations. The non-coal rules are intentionally non-prescriptive and are intended to allow DOGM to exercise its discretion and evaluate each project based on its location, size and nature in determining what information is required to be included in an NOI. Earth Energy's NOI contains all of the information DOGM staff determined was

required, and provides sufficient information upon which approval of the NOI could be made under the Mineral Rules.

Moisture Content of the Tailings

The testimony of Living Rivers' experts, Elliot Lips ("Lips") and Charles Norris ("Norris"), that the NOI is inadequate is largely based on their assertion that the 10-20% moisture content of the tailings that will be impounded in the overburden/interburden storage areas and in the backfilled pit means that the tailings are "at or near field capacity" and will be "virtually saturated completely with water." (Lips at 32, line 21; Norris at 15, line 8.) It is important to dispel their erroneous characterization of the moisture content of the tailings up front because most of the potential impacts that they speculate about in their testimony are based on their assertion that leachate will be generated from the tailings and migrate to surface and ground water systems.

Both Lips and Norris arrive at their conclusions by ignoring the fact that the tailings contain a 4:1 ratio of sand and silt/clay fines; instead basing their analysis on a presumption that the tailings are made up of "unconsolidated sand." (Norris at 16, line 12.) Grain-size analysis of samples of sand and fines components has been performed and, based on this small amount of data, the combined fines and sand components are estimated to be comprised of approximately 79% sand and 21% silt and clay. In addition, the sand component is comprised of approximately 70% fine and very fine sands. These data indicate that the blended tailings would have the texture of a fine loamy sand and have a field capacity and saturation much greater than that of sand. Nevertheless, the projections of these parameters as means of predicting drainage from the tailings are an oversimplification.

The NOI states that a "shale shaker (or similar device)" to remove water from the tailings stream will be used. (NOI at 17.) Earth Energy has refined its process and determined that dewatering is better achieved by using a horizontal belt filter for the sand component and a disk filter for the fines. Earth Energy's engineers now estimate that in excess of 85% of the water will be recovered for reuse in the process. The tailings are planned to be moved from the plant site to a handling area where any water draining from the tailings will be captured for recycling. (NOI at 17.) The NOI states, and Earth Energy's engineers confirm, that the blended tailings will be at or near optimal moisture for compaction as they are placed in either the overburden/interburden storage areas or the pit. (NOI at 19) Lips and Norris' contention that the tailings will be "water-logged" (Norris at 18, line 18) is certainly untrue given the use of the mechanical dewatering techniques that will be applied.

Since the tailings will not be free draining when they are placed in the overburden/interburden storage areas or the backfilled pit, the only way leachate generation could occur would be from rainfall percolating through the tailings, wetting them to the point that they do become free draining, and then migrating through additional dry overburden/interburden material before reaching surface or groundwater systems. Given the area's low annual precipitation rate, and high annual evapotranspiration rate, the designs of the backfilled pit and the overburden/interburden storage areas demonstrate that the leachate generation described by Lips and Norris will not occur.

Surface Water Systems

R647-4-109 requires an NOI to contain a "general narrative description" of the "the projected impacts on the surface . . . water system[]" and "actions which are proposed to mitigate [those]

impacts." Earth Energy's NOI for the PR Spring Mine (the "Mine") meets this regulatory requirement. Lips' and Norris' assertions that the NOI is insufficient to meet this requirement are wrong and unsupported by the facts and evidence. First, Lips' separate evaluation of surface water *quantity* and surface water *quality* disregards their combined effects on the entire surface water systems. Second, Lips is incorrect in claiming that rainwater will lead to degradation of surface water quality by mobilizing residual chemicals and TDS from the overburden/interburden storage areas.

The NOI explains that impacts to the surface water system from the Mine will be mitigated by the design of the facility, which will be completely internally draining except for the outslopes of the overburden/interburden storage areas. (NOI at 49.) Lips' testimony that this mitigation measure creates an impact on surface water quantity by removing run-off from the Main Canyon drainage basin, while technically correct, has no relevance because the reduction of watershed area created by the placement of overburden/interburden is miniscule compared to the size of the Main Canyon watershed. The design concepts for the overburden/interburden stockpiles apply best management practices (BMPs) by limiting contact of meteoric water with the stockpiles almost entirely to direct precipitation, isolating the tailings within the stockpile, and minimizing erosion and sediment discharge by covering the outslope of the stockpile with coarse and durable waste rock. The resultant small reduction in watershed area is a tradeoff that is commonly accepted as a best management practice in the mining industry. BMPs are needed *because* a manmade disturbance is being created. The recognized need for BMPs at all levels of government regulation for any natural resources development is an acknowledgement that society cannot have its cake and eat it too. Lips' testimony is not only factually unsupported, as

the expert report submitted by Karla Knoop, an expert in hydrology, will show but it also fails to demonstrate a violation of R647-4-109.

Living Rivers' assertions that the NOI inadequately addresses impacts to surface water quality also are unsupported. Lips claims that rainfall will percolate into the overburden/interburden storage areas, and "[a]s it migrates downward, the water will incorporate residual chemicals from the processing of the tar sands and dissolved solids from these materials." (Lips at 13, lines 1-5.) He further testifies this water will then "flow along the preexisting topography of the ephemeral drainages and emerge at the toe of the dumps as surface water." (Lips at 13, lines 9-11) This testimony is unsupported by any facts or analysis demonstrating that this will occur.

Lips' testimony is wrong because the overburden/interburden storage areas will be designed and constructed to ensure that run-on of surface flows from adjacent areas will be virtually non-existent. Direct precipitation onto the surface will either infiltrate into the storage pile or flow off of the surfaces to the uppermost end of the fill area where it will be channeled to the surrounding terrain or flow into the rock-lined stream channel. The overburden/interburden storage areas are designed to prevent tailings from being placed in the center of the drainage channel to ensure that any precipitation that does reach the channel will not encounter tailings. Infiltration will be reduced even further when the surface is topsoiled and revegetated, after which the rate of evapotranspiration will greatly exceed the precipitation rate. Based on my professional judgment and experience, the overburden stockpiles are designed in accordance with best management practices and will result in no measurable impact to surface and ground water. The only threat that the Mine poses to surface water quality would be from sediment transported through erosion, which is effectively mitigated by the design of the site, and Earth Energy's commitment to use best management practices to control erosion from the site.

Erosion Control

R647-4-109 requires an NOI to contain a "general narrative description" of the "the projected impacts of mining operations on . . . erosion control" and "actions which are proposed to mitigate [those] impacts." The NOI that DOGM approved meets this regulatory requirement. Living Rivers' assertion that the NOI is insufficient to meet this requirement is wrong and unsupported by the facts and evidence.

The NOI explains that all areas of the Mine with the exception of the outslopes of the overburden/interburden storage areas will be designed to be internally draining; thereby, removing any threat of contributing run-off or sediment to the Main Canyon drainage. (NOI at 48.) Erosion control from the overburden/interburden storage area will be controlled by armoring the channel, facing the outslopes with coarse overburden material and installation of rip-rapped energy dissipaters at the toe of the storage areas. (NOI at 48.) These measures are proven and effective means of controlling erosion, and, in my professional judgment are more than adequate to control erosion from these relatively small storage areas. Additionally, Earth Energy has committed that "should the specific means of handling runoff and controlling erosion that are described [] be ineffective, Earth Energy would replace them with another type of BMP," ensuring that no matter what occurs in the future erosion will be controlled. (NOI at 48.) These measures, and Earth Energy's commitment, are more than adequate to satisfy the requirement of R647-4-109 regarding erosion control.

Living Rivers' expert, Lips, testifies that "[w]ithout knowing what specific erosion control features will be used, and where they will be placed, it is not possible to describe either the impacts from erosion or whether mitigation will be successful." (Lips at 19, lines 3-5) The NOI

does in fact describe the control measures and their general locations. Further, this testimony completely ignores the reality that erosion control for even these engineered overburden/interburden disposal sites must be "field fitted" to account for local terrain irregularities, and that the specific erosion control devices and exact locations will vary depending on site conditions and the stage of operation. Further, Lips' testimony that the effectiveness of the erosion control techniques discussed in the NOI is not supported by data or analysis is irrelevant. Lips contends that soil loss models, specifically the RUSLE model, should have been used. However, the erosion control techniques described in the NOI, such as armoring the channel and employing a rip-rapped energy dissipater are widely employed and known to be effective means of controlling erosion, and, as the expert report submitted by Karla Knoop discusses, data and analysis from soil loss modeling would not have provided any useful information. The DOGM staff members have a great deal of experience in overburden placement and reclamation and are quite capable of assessing the potential impacts from erosion based on experience and their own professional judgment without the need in all cases for a quantitative assessment.

Ground Water Systems

R647-4-109 requires an NOI to contain a "general narrative description" of the "the projected impacts on . . . ground water systems" and "actions which are proposed to mitigate [those] impacts." The NOI that DOGM approved for the Mine meets this regulatory requirement. Living Rivers' assertion that the NOI is insufficient to meet this requirement is wrong and unsupported by the facts and evidence.

R647-4-109 requires a "general narrative description" of impacts to the ground water system, and separating the analysis into sub parts creates a false picture of the information in the NOI required by DOGM to satisfy the "general narrative description" required by the rule. The NOI and the Ground Water Discharge Permit-by-Rule Demonstration ("GWDPRD), attached to the NOI (Appendix B), contain more than enough information about the hydrologic system, the design and operation of the Mine, and the composition of the tailings to satisfy R647-4-109. (NOI at 30-35-40; GWDPRD at 2-4.)

Ground Water Quantity

Lips asserts that the NOI is insufficient because it inadequately addresses impacts that the Mine *may* have on perched aquifers, which *may* exist. That assertion is unsupported and ignores the facts detailed in the NOI regarding groundwater. As a preliminary matter, it is important to note that DOGM and the rules and statutes it administers do not require an NOI to guarantee that perched aquifers will be unaffected by a mining operation.

That being said, the NOI and the GWDPRD demonstrate that mining the North Pit is unlikely to encounter perched aquifers. Background information from government and scientific publications regarding the hydrology of the region, which are discussed in the NOI and the GWDPRD, indicate that there are no significant sources of ground water in the upper part of the Douglas Creek Member in the area that Earth Energy will be mining.

Lips mischaracterizes language in the GWDPRD to imply that the Douglas Creek Aquifer will be impacted by the mining operatio; this is simply not true. While it is true that Earth Energy will be mining ore from the Douglas Creek Member of the Green River Formation, it is not true that the Douglas Creek Member and the Douglas Creek Aquifer are one in the same. The

proposed mine site is located at the southern boundary of the Douglas Creek Member outcrop area. (Holmes and Kimball, 1987, Ground Water in the Southern Uinta Basin Utah and Colorado, USGS Water Supply Paper 2248). In this area, the Douglas Creek Member would not be broadly saturated as it would be to the north. Instead, it is likely comprised of discontinuous water bearing horizons that discharge in the vicinity of the mine site rather than supplying recharge to the more productive zones within the Douglas Creek Member.

Even if the mining operation eliminated one or more isolated ground water occurrences and in turn dried up one or more seeps, his statement that the seeps in the mine area that discharge from them and provide a source of water for wildlife is unsubstantiated.

It is possible that the planned open pits will mine through and remove some isolated water bearing zones that provide recharge to the seeps adjacent to the mine area. These small seeps have expressed themselves as damp spots on side channel bottoms with no measurable flow when JBR scientists have examined them. Given the small recharge area supplying them, no significant quantity of discharge would be expected. The recharge area for the seeps is limited to the small drainage divide upon which the mine site is located. Such small seeps are likely to be insignificant in terms of wildlife habitat, an observation supported by the review of the NOI by DOGM experts and DWR wildlife biologists.

In addition to the information discussed above, Earth Energy has committed to additional exploratory drilling, which will provide additional information on the existence of localized shallow ground water. (GWDPRD at 13) To further ensure that localized shallow ground water is protected to the greatest extent possible, the GWDPRD provides thay, if groundwater is encountered in further exploratory drilling or during excavation of the North Pit, "Earth Energy will coordinate with DWQ to further investigate the issue." (GWDPRD at 13)

I must also take exception to Lips' assertion about what a professional in his field would do to evaluate projected impacts to ground water quantity. The data collection, maps and cross sections demanded by Lips are not required to be prepared for this mine.

In my professional judgment the information provided and additional commitments by Earth Energy exceed the regulatory requirements, and are more than adequate to address issues concerning impacts to ground water quantity. For some proposed mining operations, such a detailed investigation would be appropriate. For this proposed operation, with its relatively small disturbance area and location on a surface water divide, such an investigation would be unwarranted and unnecessary.

Ground Water Quality

Living Rivers' assertions that the NOI inadequately addresses impacts to ground water quality are similarly unsupported by facts or evidence. Lips and Norris testify that ground water might be impacted because "precipitation will percolate through the overburden dumps and tailings and will incorporate residual chemicals from the processing and dissolved solids from these materials." (Lips at 29, lines 21-23) These statements are unsupported by facts or evidence, and ignore DWQ's finding, and Earth Energy's demonstration in its GWDPRD, that the Mine will have a *de minimis* impact on ground water quality. DWQ's finding of *de minimis* impact is supported by the information provided to DWQ, including in the GWDPRD, which provides details about the ground water system at the site and Earth Energy's process. DWQ's finding of *de minimis* impact is properly relied upon by DOGM in approving the NOI's "general narrative description" of the "the projected impacts on . . . ground water systems" and "actions which are proposed to mitigate [those] impacts."

Lips and Norris' contentions that the non-disclosure of the chemical used to extract the bitumen is an issue are both untrue and irrelevant. First, a cursory review of the approved NOI available from DOGM discloses the precise extraction chemical used in the Ophus process. The chemical was identified as D-limonene in a letter from Earth Energy to the EPA, dated May 29, 2009, which is the second letter in Appendix B of the NOI. Of course, whether or not the extraction chemical was publicly disclosed is irrelevant because DWQ was provided information about the extraction chemical, and DWQ determined that it would have a *de minimis* impact on ground water quality. As DWQ concluded, "[b]ased on the Material Safety Data Sheets and other information" that Earth Energy provided relating to D-limonene, "the reagent to be used for bitumen extraction is generally non-toxic and volatile [meaning it evaporates rapidly when exposed to air and is insoluble in water], and most of it will be recovered and recycled in the extraction process." (March 4, 2008, letter to Barclay Cuthbert from DWQ's Rob Herbert, P.G., Manager Ground Water Protection Section, attached in Appendix B to the NOI.)

Norris' assertion that, "the chemical(s) used, if not details of the process(es), are a moving target and have changed over time," is also irrelevant. (Norris at 9, lines 22-23.) It appears that Norris is referring to the fact that Earth Energy has determined that a stabilizer it intended to use in the process is no longer necessary and will not be used. (Norris at 12, lines 1-16.) The implication that ongoing refinement of the extraction process is improper is nonsensical. If anything, the removal of the stabilizer from the process provides evidence that the chemical composition of the tailings is even safer then the composition of the tailings upon which DWQ made its *de minimis* finding.

Similarly, Lips and Norris' contention that TDS from the tailings will impact ground water quality are equally unfounded. Norris correctly states that the TCLP test does not provide an

accurate measure of the TDS level that leachate from the tailings would contain; however, the test was required by DWQ and, therefore, was necessary. His statements regarding the sampling-method and holding-time problems for the organic chemical analyses are correct, DWQ was well aware of these issues. (GWDPRD at 9-10.) However, data with these inadequacies are useful despite the sampling deficiencies and provide useful information on myriad other issues for which DWQ determined the results of the tests adequate to address.

Allegations of possible impacts to ground water quality conflict with the evidence concerning the groundwater system and the design of the tailings containments discussed in the NOI and GWDPRD. As discussed above, Lips and Norris' characterization of the moisture content of the tailings is inaccurate, and leachate will not generate from the tailings. As discussed above, the overburden/interburden storage areas are designed to prevent additional water from percolating into the tailings and generating leachate.

Moreover, the information obtained from published scientific and government publications and the on-site inspection of the area for seeps and springs all indicate that there are no significant sources of ground water close enough to the surface to be impacted, even if leachate were generated. Accordingly, DWQ stated: "shallow ground water at the site is not part of a regional aquifer but occurs in localized laterally discontinuous perched sandstone lenses of the Douglas Creek Member." (March 4, 2008, letter to Barclay Cuthbert from DWQ's Rob Herbert, P.G., Manager Ground Water Protection Section, attached in Appendix B to the NOI.) Further, based on records from DOGM, the closest major aquifer is located in the Mesa Verde Formation, which occurs approximately 2000 feet below the surface in the area of the proposed mine. In my professional opinion all of this information is more than adequate to support the DWQ's *de*

minimis finding and DOGM's determination that the "general narrative description" in the NOI was sufficient.

The tar sands occur generally in lenticular beds, with interbedded sandstone, siltstone, shale, mudstone and calcareous marl (NOI at 11). The intervening layers of siltstone, shale and mudstone have generally low permeability. Sandstones without bitumen are also likely to be very discontinuous or cemented; it is reasonable to presume that had they been sufficiently continuous and permeable, bitumen would also have permeated them. The bitumen-bearing sandstones were undoubtedly permeable when the petroleum fluids that formed them migrated to them; however, they have been effectively sealed by the bitumen itself. For the foregoing reasons, infiltration of meteoric water through the upper Dawson Creek Member at the proposed mine site is unlikely because the lower layers of bitumen will remain intact.

Lips further attempts to discredit DWQ's determination that the Mine will have a *de minimis* impact on ground water, by highlighting a few discrepancies between the GWDPRD and the NOI. However, neither Lips nor Norris even contend, let alone prove, that these discrepancies would have changed DWQ's *de minimis* finding.

First, Lips points out that the GWDPRD does not include a discussion of tailings being placed in the overburden/interburden storage areas. As explained in the section on surface water systems above, the overburden/interburden storage areas will be designed to prevent the percolation of rainwater through the tailings. Coupled with the evidence outlined above concerning the minimal environmental threat posed by the composition of the tailings material, placement of-all the material in the pit as opposed to mostly in the pit and partially in fully encapsulated

containment cells within the overburden/interburden storage areas does not change the potential for impact to ground water.

Second, Lips points out that the GWDPRD only discusses excavation and backfilling of the North Pit, while the NOI discusses operation in the West Pit as well. Again, this is a distinction without a difference, since the composition of the tailings and the lack of any impact to any significant ground water does not change whether Earth Energy mines 1 or 2 pits. Additionally, I have been informed that pursuant to a settlement agreement signed by Earth Energy, DOGM and Living Rivers' counsel, Western Resource Advocates, Earth Energy will not be mining the West Pit under this NOI, making any issue that may have existed irrelevant.

Finally, the statement in the DWQ's letter granting Earth Energy permit-by-rule status, that "[t]here are no springs in the Earth Energy leased area," does not support Lips' assertion that "the determination reached by DWQ is flawed." There are no springs in the entire affected area, which was the focus of DWQ's analysis. The DWQ likely understood the affected area to be the same as the leased area, based on the GWDPRD's introduction, which states, "[k]nown as the PR Spring operation, the mine and plant would initially disturb approximately 200 acres of lands that Earth Energy has leased from Utah State Institutional Trust Lands Administration (SITLA)." In my professional judgment and based on my experience in permitting mining operations in the Utah, none of the issues raised by Lips to discredit the GWDPRD and DWQ's de minimis finding are material.

Conclusion

For the reasons set forth above, and in the report of Karla Knoop, the concerns raised by Lips and Norris are unfounded. Their testimony ignores and fails to refute the evidence presented in

the NOI that: (1) the tailings will not be free draining, (2) there is no evidence of ground water of any significance at depths that would be impacted by the Mine, (3) the tailings do not pose a threat to ground water also because residual process chemical is negligible, (4) the handling and disposal of the tailings is designed to minimize the possibility of leachate generation, and (5) the design of the site, by which the majority of precipitation is collected and used in the processing of the ore, and employment of proven and effective BMPs is effective to control erosion. The information in this report and the report submitted by Karla Knoop shows that all of the evidence and information available supports DOGM's approval of the NOI.

Robert J. Bayer, P.G.
JBR Environmental Consultants, Inc.

EXHIBIT A

creating solutions for today's environment

Robert Bayer, PG

Managing Principal/Geologist-Geochemist

Years of Experience: 37

Relevant Experience

Mr. Bayer has more than three decades of experience in the environmental and minerals industries. He is a founder, shareholder, and Managing Principal of JBR Environmental Consultants, Inc. and is responsible for overall management of the company. His environmental industry experience includes the following: management of multimedia permitting projects for coal, ferrous and non-ferrous metallic and non-metallic mining operations, as well as for industrial facilities; managing and conducting environmental investigations, and management and technical review of environmental due diligence and audit projects. In addition, he is currently involved in permitting projects for both oil shale and tar sand projects on the Colorado Plateau. His due diligence experience includes: mine and mills; roasters, smelters, and refineries; oil and gas fields, gathering systems, and natural gas plants; and land disturbed and affected by abandoned mines and related facilities.

His environmental investigation experience has included investigations of sites contaminated by heavy metals; PCBs; fuels and lubricants; solvents; and asbestos. He has conducted geochemical investigations of contaminated soils, fill, and related media as well as hydrogeochemical investigations of contaminated groundwater and surface water. Subsequent to investigations, Mr. Bayer has managed remediation planning, design and cost estimate preparation for numerous facilities in the western U.S. He has extensive regulatory permitting and compliance experience involving state programs authorized under federal legislation including the Clean Air Act (CAA), the Clean Water Act (CWA), the National Environmental Policy Action (NEPA) and the Resource Conservation and Recovery Act (RCRA). He has provided expert witness services to private and public sector clients, including the U.S. Department of Justice and the U.S. Attorney for the State of Utah.

MINE & INDUSTRIAL PERMITTING & COMPLIANCE

Mr. Bayer managed and participated in more than a dozen mine and industrial permitting projects in multiple states, including Utah and Nevada. Mine projects have included coal; gold; copper; lead/zinc and non-metallic minerals aggregate mining; base metal smelting; precious metals roasting; chemical manufacturing; and fabricating plants. Permitting experience in Utah and Nevada includes participation in and management of the preparation of permit application packages for the Cyanco Winnemucca Sodium Cyanide Plant; Barrick Mercur Gold Mine; Barrick Bullfrog & Goldstrike Mines;

Areas of Expertise

- Mine & Industrial Permitting & Compliance
- Geochemical & Hydrogeochemical Investigations
- Ground Water Studies
- Oil & Gas Exploration & Development Impact Assessment
- Oil Shale & Tar Sands Permitting & Pre-Feasibility
- Site Investigation, Remediation & Closure Planning
- Auditing & Due Diligence

Education

- M.S., Geology, University of Tennessee, 1974
- B.S., Geology, Marietta College, 1971

Professional History

- JBR Environmental Consultants, Inc., Managing Principal, Vice President, Geologist-Geochemist, 1985 - Present
- Getty Mining Company, Exploration Geologist, 1975 - 1985
- Division of Water Quality Control, Geologist, 1973 - 1974
- Conoco Minerals, Geologist, 1973 - 1973
- University of Tennessee, Geology Department, Research Assistant, 1972 - 1973

Licenses

- Professional Geologist, UT
- Professional Geologist, WY

Certifications

- Asbestos Inspector/Management Planner, UT

Supplemental Training

- Climate Change Science & Policy
- Human Health and Ecological Risk Assessment
- Ground Water Geochemistry
- Oil and Gas Law and Regulation
- Geochemical Modeling (PHREEQE)
- NEPA and Federal Land Development
- Advanced Business Mgmt. Education

Affiliations

- Advisory Board, KUER Public Radio Station (University of Utah)
- Association of Ground Water Scientists and Engineers
- Board of Directors, Utah Mining Association
- Chair, Environmental Committee, Utah Mining Association (UMA)
- Member, UMA Oil Shale & Tar Sands Committee
- Rocky Mountain Mineral Law Foundation
- Society for Mining Metallurgy and Exploration, past section chair
- Society of Petroleum Engineers
- Utah Board of Oil, Gas, and Mining (completed 2nd and final 4-year term in February)

SF Phosphates Vernal Phosphate Mine; Barneys Canyon Gold Mine; Tenneco/USMX Goldstrike Mine; Inspiration Gold; Topaz Beryllium Project; Brush Resources/Topaz Beryllium Mine; 6 Utah coal mines; and ongoing projects involving copper, precious metals, oil shale, and tar sands in operation or in development. Services provided on these projects have included: preparation of mining and reclamation plans; ground water, construction permits, and storm water permits; air quality emission inventories and construction permits; and various other state agency and local government permits. He has assisted clients with compliance issues related to air quality permits, ground water discharges, applicability of storm water regulations to mining sites, discharge limitations, site-specific ground water protection limits, and interpretation of water quality data collected in permit-required monitoring activities.

GEOCHEMICAL & HYDROGEOCHEMICAL INVESTIGATIONS

Mr. Bayer has conducted geochemical and hydrogeochemical investigations at contaminated sites, sites with suspected contamination, and predictive studies for assessment of impacts by proposed mining operations. Types of sites investigated have included: undeveloped property where past contamination was suspected or mobilization of naturally occurring metals in soils and alluvium by future industrial activities was a concern; evaluation of potential impacts to soil and ground water from proposed phosphate mining operations, former landfill sites contaminated by volatile and semi-volatile organic compounds and metals with potential impacts to surface and ground water; former and active industrial sites where contamination of soils by metals, solvents and fuels was a concern; and abandoned metallic mining and milling sites with concerns for contamination by acid-rock drainage, metals, cyanides, and milling reagents. The types of investigations that Mr. Bayer has planned, conducted, and directed include: numerous geochemical and hydrogeological sampling projects in soil, bedrock, and ground water; evaluations of geochemical and hydrogeochemical data, including interpretation using various statistical applications; and, pathway and fate evaluations for metallic and organic chemicals in soils and ground water.

GROUND WATER STUDIES

Mr. Bayer has directed and carried out ground water investigations involving contaminant source identification, determination of surface water and ground water interactions, investigation of complex bedrock ground water systems, identification and evaluation of compartmentalized ground water systems, and contaminant fate and transport. Investigational methods have included installation of monitor wells, piezometers, seep and spring measurements, and geologic mapping. He has experience with most drilling methods including conventional and reverse rotary, auger, wire line coring, and direct push.

OIL & GAS EXPLORATION AND DEVELOPMENT IMPACT ASSESSMENT

Mr. Bayer was a member of the technical team preparing the Environmental Impact Statement (EIS) for oil and gas leasing in the Uinta National Forest in Utah. JBR and Shipley Group were awarded this project in fall 2005. As part of the project management team, his role includes taking the lead in determining reasonably foreseeable development scenarios (RFDSs); impacts to mineral and geologic resources other than oil and gas; and directing the compilation of geologic information for the EIS. Mr. Bayer's 6-8 years of experience on the Utah Board of Oil Gas and Mining have provided him with a unique understanding of the environmental challenges faced by both the oil and gas industry and the agencies that regulate them.

OIL SHALE & TAR SANDS PERMITTING & FEASIBILITY

Mr. Bayer is the currently managing the environmental component of a major pre-feasibility study for a potential large oil shale project located in eastern Utah. This confidential project involves assessing the environmental and socioeconomic aspects of a large mine and processing facility and the related operational infrastructure, as well as effects on community infrastructure. Mr. Bayer also participates as a senior advisor on other oil shale and tar sands permitting projects currently underway. He is an active participant in the Utah Mining Association's Oil Shale and Tar Sands Committee as well as being a regular participant in the Uinta Basin Oil and Gas Collaborative Group. Through these activities and his past membership in the Utah Board of Oil Gas and Mining, Mr. Bayer maintains a state-of-the industry understanding of all aspects of oil shale and tar sands, as well as conventional petroleum and natural gas E&P, technological, environmental, and public policy-related issues.

SITE INVESTIGATION, REMEDIATION, & CLOSURE PLANNING

Mr. Bayer has managed or participated in remediation and closure projects for industrial facilities, mines, and other contaminated sites in multiple western states, including Utah and Nevada. He is very experienced at assessing environmental conditions at operating and abandoned mine sites, in defining alternatives for reclamation or remediation, and in developing cost estimates for closure and remediation. He is also experienced in soil and ground water investigations and remediation planning for sites contaminated with hydrocarbons, including gasoline, diesel fuel, and solvents (PCE, TCE). Hydrocarbon-contaminated sites have included automobile service stations; dry cleaning; facilities; automobile and heavy truck service facilities; vehicle-painting facilities; fertilizer plants, and industrial gas production facilities.

Mr. Bayer has directed, managed, or conducted investigations of environmental contamination at numerous mining, milling, mineral processing, industrial, and commercial facilities in Utah, Nevada, California, Oregon, Missouri, Colorado, and Idaho. In addition to sites contaminated by hazardous wastes and petroleum products, Mr. Bayer has directed investigations of sites contaminated by mine waste rock, mine tailings, and metallic smelter wastes. He has planned and directed investigations of acid rock and acid mine drainage for various metallic mining sites and directed the assessment of acid-generating potential for coal mines. He has also managed pre-closure and closure work for an active Utah gold heap leach operation. Mr. Bayer has participated extensively in the evaluation of impacts to soils, surface and ground water, and biota from selenium leaching due to waste rock disposal practices in the Southeast Idaho Phosphate field.

AUDITING & DUE DILIGENCE

Mr. Bayer has managed and participated in environmental compliance audits and pre-acquisition due diligence projects for facilities in Nevada, Utah, Texas, Oklahoma, New Mexico, Colorado, California and Missouri. Facilities types have included surface and underground coal and metals mines; mills; smelters; oil and natural gas fields and gathering systems; natural gas plants; manufacturing operations; and large tracts of land, both undeveloped and tracts having abandoned mines and impacts from other former land uses.

Report of Karla Knoop, Hydrologist
JBR Environmental Consultants, Inc

Living Rivers v. Division of Oil Gas and Mining

Cause No. M/047/0090 A
Docket No. 2010-027

Scope

This report, along with the expert report submitted by Robert Bayer, will demonstrate that, with respect to the areas challenged by Living Rivers' experts Elliot Lips ("Lips") and Charles Norris ("Norris"), Earth Energy Resources, Inc.'s ("Earth Energy") Notice of Intention to Commence Large Mining Operations (the "NOI") contains the "general narrative description" of the PR Spring Mine's (the "Mine") projected impacts on surface and ground water systems, erosion control, actions which are proposed to mitigate any such impacts, and the reclamation plan required by Utah Mined Land Reclamation Rules. Utah Admin Code r. 647-4.

Basis of Opinions

Following is a list of material I have reviewed and consulted in the preparation of this report:

JBR Environmental Consultants, Inc. 2008. Report to Utah Division of Water Quality titled Earth Energy Resources, Inc. PR Spring Operation, Uintah and Grand Counties, Utah Ground Water Discharge Permit-by-Rule Demonstration. Submitted February 21, 2008 and appended to the NOI in Appendix B.

JBR Environmental Consultants, Inc. 2009. Storm Water Pollution Prevention Plan, PR Spring Mine, Earth Energy Resources, Inc. Dated March 25, 2009 and appended to the NOI as Appendix G.

JBR Environmental Consultants, Inc. 2009. Notice of Intention to Commence Large Mining Operations, Earth Energy Resources, Inc. PR Spring Mine M0470090. May 2009. Submitted to the Utah Division of Oil, Gas and Mining

Living Rivers. 2011. Prepared Direct Testimony of Elliott W. Lips on Behalf of Living Rivers. January 7, 2011. Docket No. 2010-027, Cause No. M/047/0090 A.

Living Rivers. 2011. Prepared Direct Testimony of Charles H. Norris on Behalf of Living Rivers. January 7, 2011. Docket No. 2010-027, Cause No. M/047/0090 A.

Utah. 2011. U.A.C. Title R647: Natural Resources; Oil, Gas and Mining; Non-Coal regulations and Title R645: Natural Resources; Oil, Gas and Mining; Coal regulations. As in effect on January 2, 2011.

Utah Division of Water Quality. 2008. Letter to Earth Energy Resources from DWQ, concurring with *de minimis* determination and granting permit-by-rule coverage. Dated March 4, 2008 and appended to the NOI.

Utah Division of Water Quality. 2011. General Multi-Sector Industrial Storm Water Permit and associated rules at U.A.C. R317-8, as in effect on January 1, 2011.

In addition, my opinions and conclusions are based on information obtained from: (1) discussions with other JBR personnel, Earth Energy personnel, other consultants and contractors of Earth Energy, and DOGM and DWQ staff; (2) a site visit to the PR Springs Mine area in November 2006; and (3) 26 years of experience as a hydrologist (that experience is set forth in my resume, attached as Exhibit A).

Surface Water Systems

R647-4-109 requires an NOI to contain a "general narrative description" of the "the projected impacts on the surface . . . water system[]" and "actions which are proposed to mitigate [those] impacts." Lips' and Norris' assertions that the NOI is insufficient to meet this requirement are wrong and unsupported by the facts and evidence.

Living Rivers and its expert witness, Lips, are wrong to separately analyze surface water *quantity* and surface water *quality*. The rule requires a "general narrative description" of the impacts on the system, not impacts to isolated components of the system. The NOI explains that impacts to the surface water system from the Mine will be mitigated by designing the site to be completely internally draining except for the outslopes of the overburden/interburden storage areas. (NOI at 49.) Lips' testimony that this mitigation measure creates an impact on surface water quantity by removing run-off from the Main Canyon drainage basin improperly creates a Catch-22 situation for Earth Energy, in which protective measures designed to mitigate impacts to water quality from the facility's run-off are viewed as impacting water quantity.

Surface Water Quantity

Lips' separate evaluation of surface water quantity and surface water quality disregards their combined effects on the surface water systems. Earth Energy's operation would disturb a total of 213 acres within the Main Canyon watershed. (NOI at 1.) Currently, this 213-acre area produces runoff on an irregular basis as a result of intense precipitation or rapid snowmelt. The runoff may be conveyed as overland flow and/or as channelized flow in small ephemeral washes, which are characterized in the NOI as having very small active channels.

This run-off pattern would change during Earth Energy's operations: most of the 213-acre disturbance would be internally draining and its runoff would not contribute stream flow to Main Canyon. (NOI at 16.) Only the outslopes of the overburden/interburden storage areas (approximately 26 acres at maximum build-out) would be capable of producing runoff, and due to their engineered configuration, they would be expected to do so only rarely. Lips contends the Mine will impact surface water quantity by removing the internally draining portion of the Mine from contributing run-off, and further alleges that the NOI is deficient for failing to model run-off pre and post-disturbance. Not only are these models not required by R647-4-109, they would have added no meaningful data to the NOI.

Lips specifically refers to the Curve Number/Unit Hydrograph method that, as he says, is in common use. This method uses a single, specific rainfall event (e.g. a 10-year, 24-hour storm) as the basis for its calculations. This method is commonly used as a basis for designing structures like ditches and storage ponds. However, the Curve Number/Unit Hydrograph method is not suited to determine annual runoff quantity, snow melt, or stream flow characteristics other than

those from a single, chosen storm event.[1] Knowing the runoff volume or peak flow rate that results from a given design storm does not provide any useful information regarding how far downstream flows progress, nor does it have any bearing on the overall hydrologic regime of a watershed.

Considering the area of the Mine, the "general narrative description" of projected impacts to the surface water system is sufficient, and it was unnecessary for the NOI to include detailed modeling of pre and post-disturbance run-off. Main Canyon is the receiving stream for the area that would be disturbed by the PR Spring operation. It has a contributing watershed area of 119 square miles. It is inconceivable that Earth Energy's proposed withholding of run-off from approximately 190 acres (0.3 square miles) of this watershed would measurably reduce the effective watershed area of Main Canyon. While there is not necessarily a one-to-one correlation of watershed area with runoff quantity (particularly during a storm event), this areal proportion provides the context for why the NOI approved by DOGM does not, and is not required to contain, detailed data and modeling of run-off from the Mine.

This areal proportion also refutes Lips' assertion that wildlife will be impacted because Earth Energy will capture run-off from the affected area during operations. The run-off withheld from the drainage by the affected area in comparison to the streamflow produced elsewhere in the 119 square mile watershed is simply too small to impact wildlife. Indeed JBR, Earth Energy, and DOGM consulted the Utah Division of Wildlife Resources during the NOI process (through the

[1] The following resources provide a general description and information regarding the proper application of the method: Natural Resources Conservation Service, 1986, National Engineering Manual Section 4 Hydrology, USDA (also known as National Engineering Manual Part 630).

RDCC and in direct discussion with JBR biologists). No wildlife water source issues were raised by any of those experts.

Surface Water Quality

Living Rivers' assertions that the NOI inadequately addresses impacts to surface water quality also are unsupported. Lips claims that rainfall will percolate into the overburden/interburden storage areas, and "[a]s it migrates downward, the water will incorporate residual chemicals from the processing of the tar sands and dissolved solids from these materials." (Lips at 13, lines 1-5.) He further testifies this water will then "flow along the preexisting topography of the ephemeral drainages and emerge at the toe of the dumps as surface water." (Lips at 13, lines 9-11.) Additionally, Norris testifies that alluvial flow *may* exist and *may potentially* carry any water that discharges from the storage areas to surface water down drainage. (Norris at 26, lines 17-20.) Lips' and Norris' testimony is unsupported by any facts or analysis demonstrating that this will occur. Furthermore, it conflicts with the evidence in the NOI demonstrating that leachate will not be generated from the tailings stored in the overburden/interburden storage areas, and that any discharge or run-off from the overburden/interburden storage areas that does occur is not projected to impact surface water in the Main Canyon or further downstream. These areas are addressed in the expert report submitted by Robert Bayer.

In addition, the NOI provides a description of the hydrology of the surface water system and the water quality of that system with references to reliable, published information. (NOI at 30, 35, and 37-40; *see also* Ground Water Discharge Permit-by-Rule Demonstration, attached in Appendix B to the NOI ("GWDPRD") at 2-4.) This published information provides an adequate description of the surface water quality, considering the size, location, and projected impacts of

the Mine, by generally discussing water quality of springs in the area, and also provides information on water quality downstream in Willow Creek. (GWDPRD at 4.) This information provides adequate background on water quality in the area to support the NOI's demonstration that there are no projected impacts to surface water quality from the Mine. Lips' assertion that baseline water monitoring was required to make this determination is erroneous. Unlike DOGM's coal program, the mineral program under the 647 rules does not require an applicant to conduct baseline water monitoring prior to operations.

Although background information on surface water quality was provided, it is important to note that Earth Energy's plan contemplates no discharge of anything more than sporadic run-off from the outslopes of the overburden/interburden storage areas, which are comprised of the broken – but otherwise unaltered – native material removed from the pit. Surface water quality data is not a prerequisite to assessing the impact of run-off from these surfaces. (R647-4-109.)

Additionally, Norris' contention that water from the overburden/interburden storage areas will flow sub-surface to surface water down drainage is not supportable. The GWDPRD and the NOI provided information to support the conclusion that subsurface flows out of the overburden/interburden storage areas would not occur. (NOI at 18-19, 35-40; GWDPRD at 2-7.) Without such flows out of these areas, there would not be a mechanism for subsurface flows to reach surface streams. In addition, information in the NOI indicates that the drainages directly downstream of each of the overburden/interburden storage areas are ephemeral in nature. (NOI at 30.) By definition, these streams do not have contact with ground water, they do not have a hyporheic zone, and they do not have any more than a fleeting shallow subsurface flow component associated with direct runoff from a specific precipitation event. In sum, an ephemeral stream does not otherwise have the "subsurface alluvial flow" mentioned by Norris.

Erosion Control

R647-4-109 requires an NOI to contain a "general narrative description" of the "the projected impacts of mining operations on ... erosion control" and "actions which are proposed to mitigate [those] impacts." Living Rivers' assertion that the NOI is insufficient to meet this requirement is wrong and unsupported by the facts and evidence.

Lips testifies that the NOI is inadequate because it does not include soil loss modeling using the Revised Universal Soil Loss Equation ("RUSLE"). First, DOGM's rules do not require an NOI to contain such quantitative analysis of erosion control. Second, such quantitative analysis would not have provided any useful information. The RUSLE that Lips claims should have been applied would not have been useful. Based on the size of the drainage and the relatively small acreage of the outslopes of the overburden/interburden storage areas, the results of the equation run with pre and post disturbance estimations would be well within the margin of error of each other, and would provide no useful information. In addition, in my experience, no available soil loss model would be able to provide meaningful information about sediment delivery from these outslopes to Main Canyon.

The information in the NOI regarding erosion control measures that Earth Energy will employ at the Mine provide further evidence that soil loss modeling was unnecessary. As demonstrated in the NOI, only the outslopes of the overburden/interburden storage areas have the potential for erosion impacts, and the exposed outslopes of the interburden/overburden storage areas will at no time include tailings. (NOI at 20.) Instead, the exposed surfaces would be made up of the broken – but otherwise unaltered – overburden/interburden materials removed from the pit.

(NOI at 21.) These materials would be variously sized, with the largest boulder-sized components residing closer to the base of the slopes than the finer rubble sizes. (NOI at 21.)

Only precipitation falling directly upon the outslope would have the potential to generate runoff; all other affected-area runoff would be contained, and no up-gradient, undisturbed-area runoff would contact these slopes. Storm water runoff would be expected to occur only during infrequent, intense storm events; so contact time with the exposed slopes would be minimal. There would be little or no opportunity to form solutes, given the contact time and the geologic nature (lacustrine sediments, not marine origin) of the material. Additionally, as described in the NOI and the SWPPP, sediment pickup from these outslopes would be reduced by their design features, and sediment delivery would be reduced by the energy dissipaters to be constructed at the base of the slopes. (NOI at 48.)

Further, Earth Energy's NOI also commits to numerous Best Management Pracitices ("BMPs") and mitigative measures throughout the affected area (not just the previously discussed outslopes) and throughout all phases of its project. (NOI at 48-50.) From the initial stages of the project, through the final operational stages, erosion and runoff control would be in place, as would other nonstructural BMPs. (NOI at 48-50) Specifically, the Storm Water Pollution Prevention Plan ("SWPPP") that is incorporated in the NOI requires good housekeeping practices, preventative maintenance for both equipment and structural BMPs, weekly inspections of sediment control measures, storm water training for employees, and visual monitoring for runoff. (*See* SWPPP, attached to the NOI as Appendix G.) Last, the reclamation section of the NOI mentions erosion and sediment control numerous times. (NOI at 52-61.) In my professional opinion, and based on my experience, it is entirely possible for Earth Energy to comply with these commitments, and the design of the Mine and the deployment of these

effective and proven means of erosion control to which Earth Energy has committed to are more than adequate to meet the requirements of R647-4-109.

Groundwater System

R647-4-109 requires an NOI to contain a "general narrative description" of the "the projected impacts on . . . ground water systems" and "actions which are proposed to mitigate [those] impacts." Living Rivers' assertion that the NOI is insufficient to meet this requirement is wrong and unsupported by the facts and evidence.

Background Ground Water Information

Lips asserts that the NOI and GWDPRD are inadequate because they do not provide sufficient information describing the ground water system in the area of the Mine. This assertion is simply not true. The NOI contains a description of ground water in the area based on information from reliable, published, scientific and governmental sources as well as site-specific data collected by Earth Energy and site visits by JBR personnel. (NOI at 36 and 39.) The publications show that the nearest ground water source of any significance is located in the Mesa Verde Formation and is found at a depth of more than 1,200 feet below the surface, based upon records from wells drilled less than 3 miles away from the Mine. (GWDPRD at 3.) The State agency charged with protecting state waters agreed: "Shallow ground water at the site is not part of a regional aquifer but occurs in laterally discontinuous perched sandstone lenses of the Douglas Creek Member. Based on records from [DOGM], the closest major aquifer is the Mesa Verde Formation, which occurs approximately 2000 feet below ground surface in the area of the proposed mine." (Letter dated March 4, 2008, to Barclay Cuthbert from Rob Herbert, P.G., Manager Ground Water Protection Section, DWQ attached in Appendix B to the NOI.)

The published literature also reports that most springs in the area discharge from the Parachute Member of the Green River Formation. (GWDPRD at 2) These springs provide evidence of localized, shallow ground water, however, no springs are found in the direct vicinity of the North Pit, indicating that localized, shallow ground water is not likely to be encountered by pit excavation. Also reviewed for background were water right filings in the State Engineer's Office that show a number of water right applications had been filed on alleged springs in the area. These filings are identified in the NOI at pages 39-40. It is important to note that six of these filings have been rejected.

Additionally, the scientific and government publications provide information on ground water quality based on data collected from springs in the region. (GWDPRD at 2-4.) These publications report that water from springs in the region had TDS levels ranging from 300 to 6,100 mg/L. (GWDPRD at 4.) PR Spring has a reported TDS levels of 380 mg/L. (NOI at 4.)

The GWDPRD and the NOI also include site-specific information collected by Earth Energy and its consultants. (NOI at 30 and 35-40; GWDPRD at 2-4.) In May 2007, JBR personnel (a wetland specialist and a biologist) examined the affected area specifically to examine a supposed spring that was referred to in a water right application, which is one of the six applications that has since been rejected by the State Engineer. When they found absolutely no evidence of a spring (or even a seep) in that area, they began to examine other nearby areas in case the water right filing had misidentified the spring location. Potential seeps were noted downstream of the water right filing and downstream of the affected area with flows to small to be measured. NOI at 36.) Given the time of year (May), the very small areal extent of the saturation, the lack of flow downstream of the occurrence, the nature of the vegetation at the site, and other observations, the seeps were reasonably thought to be both localized and temporal.

Earth Energy's contract geologist also visited the site during that same season and mapped the four "seep" areas that are shown on NOI Figure 7; these include the seep locations noted by JBR. (GWDPRD at 3.) The following year (June 2008), DWQ personnel visited the site with the intention of collecting samples, but no samples were collected due to lack of water.

These efforts are more than adequate to satisfy the requirements of R647-4-109, and Lips' assertion that they are inadequate is in error. Lips claims that the NOI is inadequate because a formal seeps and springs inventory was not conducted is also in error. A formal seeps and springs inventory is required under the Coal Rules, but not under the Mineral Rules that govern this NOI. The background information about the system provided in the NOI and GWDPRD is adequate to support DWQ's *de minimis* finding and DOGM's determination that there are no projected impacts to ground water from the mine.

Reclamation

R647-4-110 requires that an NOI "include a reclamation plan, including maps or drawings as necessary, consisting of a narrative description of the proposed reclamation." Living Rivers' experts provide no testimony even attempting to show that the NOI approved by DOGM does not meet this requirement. Despite his acknowledgement that R647-4-111 does not need to be addressed in the NOI, Lips asserts that it will be impossible for DOGM to adequately assess Earth Energy's reclamation of the Mine because there is no baseline data to use as a comparison. This assertion is in error, not only because the rule does not require any specific baseline information, but also because, as outlined above, the NOI contains sufficient baseline information for DOGM to adequately monitor the reclamation of the site.

Lips' testimony identifies five reclamation practices that he alleges are not addressed in the NOI. Despite the fact that the NOI is not required to address reclamation practices, my review of the NOI shows that all five are addressed. The reclamation plan in the NOI describes topsoil placement, grading, contouring, all of which minimize erosion. (NOI at 27.) In fact, it notes that erosion control is a primary focus of the reclamation plan. (NOI at 55.) The SWPPP would continue to be in effect and requires inspections and maintenance. (NOI at 50.) The NOI details revegetation practices and provides a seed mix designed to support the postmining land use. (NOI at 59-61.) It stipulates both qualitative and quantitative monitoring to track the vegetation establishment. (NOI at 61.) The NOI describes that the interburden/overburden storage areas would be regraded to slopes to between 2.5h:1v to 3h:1v, which is range is significantly flatter than many mining reclamation plans in Utah call for (slopes are commonly only graded to 2h:1v). (NOI at 54.) In addition, it describes a concurrent pit backfill approach to reclamation, which is also an exemplary way to approach reclamation at a mining site, and rarely seen in Utah. (NOI at 54.) The NOI includes a section within the reclamation plan, which addresses deleterious materials and how they would be handled during reclamation. (NOI at 56-57.) While the small ephemeral channels underlying the interburden/overburden storage areas would remain filled, drainage from the area has been adequately planned and described in the NOI and as per the reclamation map (Figure 9).

The primary purpose of R647-4-110 is to provide DOGM with enough information to properly calculate a reclamation bond for the site that will ensure that there are sufficient resources available to reclaim the site to the standard of the Utah Mined Lands Reclamation Act. Utah Code Ann. § 40-8. DOGM reviewed the information in the NOI and set a bond adequate to

ensure compliance with that standard. Lips' testimony that baseline information is required for DOGM to make this determination is unsupported by the rule.

Lips asserts that the NOI is insufficient because the visual inspections discussed in the NOI are insufficient to ensure the statutory reclamation standard is met. This assertion is based on a gross distortion of the NOI, R647-4-110, and the Mined Land Reclamation Act. To imply that DOGM is restricted to only making visual inspections of the site because that is what is discussed in the NOI is simply untrue, the statute and rules provide DOGM the ability to conduct the monitoring that it deems necessary to ensure compliance with the statute. At this point, and based on the information in the NOI, it is reasonable to state that visual inspections are all that will be required to ensure compliance. However, DOGM's ability to ensure compliance with Utah Code Ann. § 40-8 is not limited by that statement, they retain jurisdiction and will not release the reclamation bond until the requirements of the statute are met.

Conclusions

For the reasons set forth above, and in the report of Robert Bayer, the concerns raised by Lips and Norris are unfounded. Their testimony ignores and fails to refute the evidence presented in the NOI that: (1) no ground water of any significance exists at depths that would be impacted by the Mine, (2) the tailings do not pose a threat to ground water also because residual process chemical is negligible, (3) the handling and disposal of the tailings is designed to minimize the possibility of leachate generation, and (4) the design of the site, by which the majority of precipitation is collected and used in the processing of the ore, and employment of proven and effective BMPs is effective to control erosion. The information in this report and the report

submitted by Robert Bayer shows that all of the evidence and information available supports DOGM's approval of the NOI.

Karla Knoop, Hydrologist
JBR Environmental Consultants, Inc.

EXHIBIT A

JBR

creating solutions for today's environment

Karla Knoop, Hydrologist

Hydrologist

Years of Experience: 38

Relevant Experience

Ms. Knoop has extensive years of experience as a surface water hydrologist performing various aspects of hydrologic analysis. She has performed classical hydrologic studies for research, investigatory, environmental permitting, remediation, and impact assessment purposes. Ms. Knoop has generally focused on the hydrologic and hydraulic aspects of surface processes including runoff, erosion and sedimentation, and stream channel morphology. Her work encompasses the regulatory aspects of water resources as well, and she is experienced in the application of National Environmental Policy Act (NEPA), Clean Water Act (CWA), Section 404, and other related Federal and State water-related programs.

NEPA/ENVIRONMENTAL PERMITTING & COMPLIANCE

Ms. Knoop has contributed her expertise in hydrology to clients needing various types of permits including Utah Stream Alteration Permits, Corp of Engineers 404 permits, Water and Wastewater Discharge permits, ground water discharge permits, storm water permits, and other permit aspects related to water resources. She also manages and assists with projects that require operating permits for coal, mineral, and other mining activities in Utah. These projects include:

- Assisting various clients with compliance and permitting associated with NPDES programs, including special conditions associated with the Colorado River Salinity Control Forum and with 303(d)/TMDL-affected waters.
- Assessing width, riparian condition, and volume of fill for various crossings (roads, pipelines, etc.) for multiple projects. Permitting related aspects including design specifications, and special construction and maintenance stipulations to protect nearby water resources.
- Analyzing water quantity and quality in support of applications to discharge wastewater or storm water to waters of the U.S.
- Preparing and overseeing preparation of mine permit applications, notices of intent, and permit amendments for various types of mines in Utah. Coordinating with clients and state agencies in support of these permit activities.

As components of various projects, Ms. Knoop has assessed water resources in light of compliance with NEPA; State of Utah water rights regulations; federal

Areas of Expertise

NEPA/Environmental Permitting & Compliance
Hydrology & Geomorphology
Resource Monitoring & Management
Site Reclamation

Education

- B.S., Watershed Science, Utah State University, 1979

Professional History

- JBR Environmental Consultants, Inc., Hydrologist, 1997 - Present
- Great Basin Earth Science, Inc., Hydrologist, 1995 - 1997
- JBR Environmental Consultants, Inc., Hydrologist, 1988 - 1995
- Uintex Corporation, Hydrologist, 1981 - 1988
- Bureau of Land Management, Field Hydrologist, - 1981
- Oregon State University Forest Research Lab, Research Hydrologist, 1979 - 1980

Certifications

- Certified Professional Hydrologist

Affiliations

- American Institute of Hydrology
- American Water Resources Association

floodplain and flood mapping programs including Flood Insurance Studies; and waters of the U.S., 404 investigations, point source pollutant discharges, and other CWA programs.

HYDROLOGY & GEOMORPHOLOGY

Ms. Knoop has an extensive background in hydrology including modeling wildland and developed watersheds and flow systems; interpreting surface water and ground water interactions; conducting infiltration and seepage studies; analyzing regional and localized water resources for baseline investigations; applying statistical techniques to hydrologic evaluations; and classifying and/or rating stream channels using methods developed by Rosgen and others. Such projects include:

- Detailed rainfall-runoff modeling for design purposes.
- Water balance calculations for wetland mitigation planning.
- Flow frequency analysis for flood studies in large basins with diversions and flow regulation structures.
- Field investigations of perennial, intermittent, and ephemeral streams regarding channel stability, indirect discharge measurements, and channel type.
- Predicting and measuring soil loss and sediment yield.
- Evaluating in-stream sediment transport.
- Measuring and modeling scour and fill.
- Providing sediment source evaluations.
- Assessing impacts related to river crossings, road alignments, and other activities.
- Analyzing potential for water quality impacts as required for NEPA projects.

RESOURCE MONITORING & MANAGEMENT

Ms. Knoop has completed numerous projects related to tracking and maintaining the quality of surface water resources. These projects have included:

- Designing, evaluating, and implementing water monitoring programs.
- Investigating stream health using chemical, channel substrate, and macroinvertebrate indicators.
- Conducting studies on sediment/total dissolved solids/salinity relationships during storm runoff and base flows.
- Conducting statistical analyses and interpreting data from chemical and microbiological water quality monitoring programs.
- Investigating drinking water quality issues.
- Recommending or evaluating quality control-quality assurance procedures for water monitoring programs.

SITE RECLAMATION

Ms. Knoop is experienced in the following aspects of planning and design as they relate to overall site reclamation projects: creating stream channel restoration and drainage re-establishment plans; preparing runoff and erosion control plans; designing wetland creation/enhancement projects for loss mitigation; and designing sedimentation ponds, lined and unlined channels, spillways, slope treatments, drop structures, and similar types of structures. Projects include:

- Designing a juniper revetment structure to protect a stream-side reclamation project, allow degraded channel banks to rebuild, and prevent channel migration which could expose coal materials.
- Preparing design drawings and accompanying text in support of a stream relocation permit to alter the course of two small perennial streams.
- Providing complete hydrologic, hydraulic, construction specifications, and permitting aspects of runoff control plans for industrial facilities.